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E Q U I P M E N T R E P O R T

Paradigm Studio/100 loudspeaker

Thomas J. Norton

My initial exposure to Paradigm's Studio/100, the top model in that Canadian loudspeaker manufacturer's new Reference series, was one of the more rewarding experiences I had at HI-FI '96 in New York. As I listened to familiar program material, there were no signs of anything seriously amiss: the midrange sounded neutral, the top end was clean and open with none of the symptoms of an overeager metal-dome tweeter, and the bass was solid without boom. True, there *were* better-sounding loudspeakers at the show, but most of them required a second mortgage.

Competition in the $2000/pair price range is as fierce as any in the loudspeaker marketplace, but on that first listen the Studio/100's appeared to have what it takes. Murky as my crystal ball often is, I saw a review in my future.

Description

When the Studio/100's finally arrived, my first impression was of an exceptionally well-finished loudspeaker. All exposed surfaces were covered in a beautiful light cherrywood veneer. Large, gold-plated feet serve to both enhance the overall appearance and to lock the furnished spikes in place after the loudspeakers are leveled. There are dual sets of five-way binding posts on the rear for bi-wiring or bi-amping, if desired.

The Studio/100's low-mass, pure aluminum-dome tweeter (manufactured by Paradigm and used in all models in the Reference series) is ferrofluid-damped, with an oversized rear acoustic damping chamber. As in all of the drivers in the 100, it has a diecast aluminum chassis that both minimizes mechanical flexing and acts as a heatsink. The midrange (also made by Paradigm) has a butyl suspension, special heatsink fins combined with something Paradigm calls AVS™ airflow ventilation, a high-temperature, multilayer voice-coil with ventilated Apical™ formers, and a mica-loaded polymer cone (Paradigm calls this design MLP™—for the obvious reason). The latter is said to have a high stiffness:mass ratio with good internal damping. Bass crunch is provided by two 8.5" woofers—both of which cover the entire low-frequency range—combined with a single, front-located port. The port is flared on both ends to minimize port noise.

Paradigm uses what they refer to as Cascade™ technology for their enclosures. This appears to be nothing more or less than a combination of well-known, quality construction techniques.

Description: Three-way, four-driver, floorstanding, reflex-loaded loudspeaker. Drive-units: 1" (25mm) aluminum-dome tweeter, 6.5" (170 mm) MLP™ mica-polymer–cone midrange, 2/8.5" (215mm) filled polypropylene–cone woofers. Crossover frequencies: 250Hz (second-order) and 2kHz (third-order). Frequency response: 39Hz–22Hz, ±2dB, on-axis; 39Hz–20kHz, ±2dB, 30° off-axis. Sensitivity: 91dB/W/m (room), 88dB/W/m (anechoic). Nominal impedance: 6 ohms. Minimum impedance: 4 ohms. Recommended amplifier power: 15–350W. Maximum input power: 210W (typical program source, clipping no more than 10% of the time).
Dimensions: 45" (1150mm) H by 10.25" (260mm) W by 16.5" (420 mm) D. Weight: 174 lbs/pair.
Finishes: black ash, light cherry, or dark cherry wood veneers.
Serial numbers of units reviewed: 11556/11557.
Price: $1800/pair to $2250/pair, depending on finish. Approximate number of dealers: 200.
Manufacturer: Paradigm Electronics Inc., 101 Hanlan Road, Woodbridge, Ontario, Canada L4L 3P5. Tel: (905) 850-2889. Fax: (905) 850-2960.

The large, 3+ cubic-foot cabinet is composed of MDF throughout. Interlocking horizontal and vertical braces add rigidity. The interior is well-damped with a fibrous material Paradigm calls Miraflex.™[1]

The Studio/100's relatively simple crossover is a phase-coherent, quasi-Butterworth design. Most loudspeakers use complex circuits not only to perform

1 You have probably determined by this time that Paradigm's engineering division keeps the trademark division in business.

the high-pass/low-pass duties, but also to correct for inherent flaws in the individual driver responses. Paradigm argues that the smooth responses of the raw drivers used in the Reference series make the latter requirement unnecessary—thus the simpler network. Quality parts used in the crossover include ceramic resistors, film capacitors, and both air- and steel-core inductors.

My only quibble about the physical design of the Studio/100 is a familiar refrain: I didn't care for the binding posts at all, despite their quality appearance. They may only be finger-tightened—very difficult to do in their cramped, recessed location—and the shanks are too thick to accept the spade lugs found on many of today's high-quality cables (see "An Open Letter" sidebar).

Sound

I began my listening by positioning the Paradigm Studio/100's in the locations that have served me well for many loudspeaker reviews: across a room diagonal. The results were not particularly promising. I removed the speaker grilles. (I later realized this was not necessarily optimum, though it is with many loudspeakers.) The imaging was good, but the timbre was wrong. The top end was a little fizzy, the bass too warm and full. The latter problem appeared to be concentrated in a narrow band in the midbass, rather than in a broadly elevated response.

I quickly decided that a different room setup was needed. Accordingly, I rearranged things to locate the Studio/100's on the short wall, firing down the long dimension of the room. They were placed well out into the room, a good 5" from the front wall[2] and well out from the side walls. The toe-in was midway between straight-ahead and aimed directly at the listener.

Now things started to cook. The midrange was open and free of any obvious colorations. The soundstage began at the plane of the loudspeakers and extended wide and deep. The bass was strong, just a shade warm, extended (though not into big-subwoofer territory), and well balanced with the rest of the range.

The top end, however, remained just a little too prominent. Not truly bright—though I did occasionally note a trace of bite in the mid-treble—and certainly not etched. But the tweeter did exhibit a little of that "listen to me" quality.

Putting the grilles back on made a noticeable improvement in the balance. If anything, the top end was perhaps now a little too sweet. At first I missed the added sparkle of the *au naturel* look—if a loudspeaker errs at the top end, I generally tend to prefer slightly too much detail than too little. It's a guilty pleasure, but only up to a point. And while in its uncovered state the Studio/100 did not (for me) go beyond that point, I ultimately have to admit that, with the grilles in place, its sound was better integrated.

How much of this improvement was due to the slight losses inevitable

2 The front wall is the wall the listener faces—the wall *behind* the loudspeakers—often erroneously referred to (in both JA's and my judgment) as the back wall. The back wall is the wall behind the *listener*. If you get this bass ackwards, you have a real treat in store if you ever have to deal with a surround-sound setup. ("Let's see, the rear speakers go on the front wall, and the front speakers are located just out from the back wall…")

M E A S U R E M E N T S

John Atkinson measured the Paradigm Studio/100's and provided me with the results after most of my listening tests were completed. The measurements were made with the grilles removed.

The Paradigm's sensitivity measured to spec at an estimated 88.3dB/W/m (B-weighted). Its impedance is shown in fig.1. The cabinet's port is tuned to a very low frequency—apparently about 20Hz. The usual double-peak curve in the bass typical of the impedance magnitude of a ported enclosure design is not visible; the cabinet is very overdamped, and appears to behave more like a sealed box than a reflex design. The small ripple visible at 25kHz is the ultrasonic tweeter resonance. The minimum impedance is 3 ohms at 90Hz, and the phase characteristics are relatively benign. While this should not be a particularly difficult load for a well-designed amplifier, that amplifier should be able to handle loads somewhat below 4 ohms. The impedance magnitude of the Studio/100 remains slightly below 4 ohms from just below 60Hz to 400Hz—the region where a lot of music has its heaviest energy concentrated.

Fig.2 shows the FFT response of the Studio/100's drive-units measured on the tweeter axis at a distance of 50", combined with the nearfield responses of the woofers, midrange unit, and the port. As expected from the highly damped design, the port output is well down in level (and the port resonances are therefore of little concern). The response of the two woofers exhibits a noticeable rise in the mid-to-upper-bass region (probably due to coupling of the two drivers), but the woofers' top-end rolloff is unusually smooth. The woofer/mid crossover appears to be at 200Hz—close to the specified 250Hz. The small dip around 2kHz is likely due to the mid/tweeter crossover.

Fig.3 is the spatially averaged response taken at a distance of 50" combined with the complex sum of the nearfield responses. The rising response in the bass was not really a problem in my room—the slight rise in the treble may compensate for it subjectively—though the bass rise could be a factor in a smaller space, and might also make a match with a subwoofer difficult (if such an option is of interest to you). Though the overall response is not flat, it *is* remarkably smooth. I was surprised to see that the bass is down only 6dB at 24Hz. But this is relative to 0dB, *not* to the mid/upper

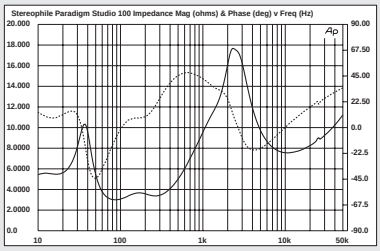

Fig.1 Paradigm Studio/100, electrical impedance (solid) and phase (dashed) (2 ohms/vertical div.).

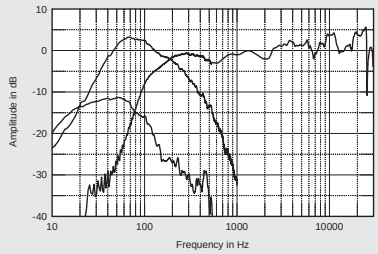

Fig.2 Paradigm Studio/100, acoustic crossover on tweeter axis at 50", averaged across 30° horizontal window and corrected for microphone response, with nearfield woofer, midrange, and port responses plotted below 1kHz, 600Hz, and 600Hz, respectively.

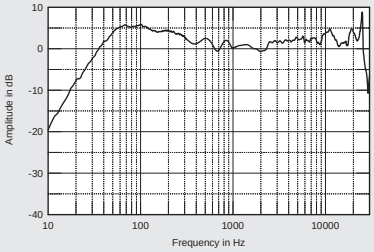

Fig.3 Paradigm Studio/100, anechoic response on tweeter axis at 50", averaged across 30° horizontal window and corrected for microphone response, with complex sum of nearfield woofer, midrange, and port responses plotted below 300Hz.

through *any* grillecloth and how much was due to reduced diffraction is hard to say. But the Paradigm *is* designed to be used with grilles on-board. The grille frame is cut to fit closely around the drivers, resulting in a relatively seamless front baffle without the sharp discontinuities presented by the driver frames. I was spring-loaded to listen to the Studio/100s with the grilles off—a case of assuming too much, I suppose.

With the speakers now well positioned and the grilles back where they belong, the Studio/100's came into their own. The overall sound was now smooth and sweet, with just the right degree of presence. There was no sense of fizz or metallic edge. Vocal sibilants were spot-on. Even on bright—but clean—pop mixes the top end held together. The Paradigms will not suffer really bad recordings without complaint, but what good loudspeaker will? There did seem to be a little less air and spaciousness than optimum, but in no way could the sound be called dull or rolled-off. Rechecking my impressions once again with the grilles removed, the sound *did* become more sparkling, detailed, and lively, but at the cost of some refinement and, with a lot of material, a too-crisp overall sound.

The midrange remained consistently clear and uncolored. If I had to quibble (a reviewer's gotta do what a reviewer's gotta do), I would comment on that

An Open Letter to Loudspeaker Manufacturers

Since certain new European standards might well deal a death blow to dual banana plugs, and since few people use them these days anyway, why not space the input terminals, say, 2" or so apart? Also, lay them out laterally (four across for bi-wiring) so that the loudspeaker cables can be neatly dressed toward the floor. The terminal shanks should fit all standard spade lugs *and* be strong enough not to break off at the hands of an overeager installer with a nut driver (or is that a nut with an installing driver?). And you really don't need to recess the terminals at all: How many users today jam their loudspeakers hard up against the wall? Recessing the terminals and spacing them closely together—especially that foursquare nightmare used for most bi-wire connections—is only an excuse to use those cheap, plastic, recessed terminal cups that Taiwan pumps out by the millions.

This critique is *not* aimed only at Paradigm; it's been building with me and addresses a plague common to nearly all loudspeakers. And yes, reviewers are hardest hit because of all the system changes we must make. But I can't imagine dealers are any happier with the situation.

There. I feel better already.

– Thomas J. Norton

M E A S U R E M E N T S

bass peak at 60–100Hz; the rise in the midbass may act to mask the otherwise good apparent low-bass extension.

The Studio/100's vertical response family, plotted relative to the on-tweeter-axis response (the latter is normalized to flat, with the remaining curves showing the *changes* as the listener moves off-axis), is shown in fig.4. This remarkable performance is among the best we have seen, with no serious deviations from the lower woofer axis to 10° above the tweeter. Any reasonable seating height should be suitable with this loudspeaker. Fig.5 shows the horizontal dispersion, again referenced to the on-axis response. There is a little beaming visible in the midrange driver at the top end of its band. Some minor peaking is visible slightly off-axis at just over 7kHz—which *might* have contributed to the occasional brightness I heard. (The latter is not easily explained by the smooth-looking response in fig.3.)

Fig.6 shows the step response of the Studio/100 (the ripples visible just beyond 7ms are room reflections). The impulse response (not shown) is excellent. The step response indicates that the three drivers are not connected in the same polarity. (Such a result does *not* necessarily indicate a design error, but rather a design choice.) The loudspeaker is not time-coherent. (Again, this is not necessarily a negative—despite all the talk about it, the audible significance of absolute time coherence in a multidriver

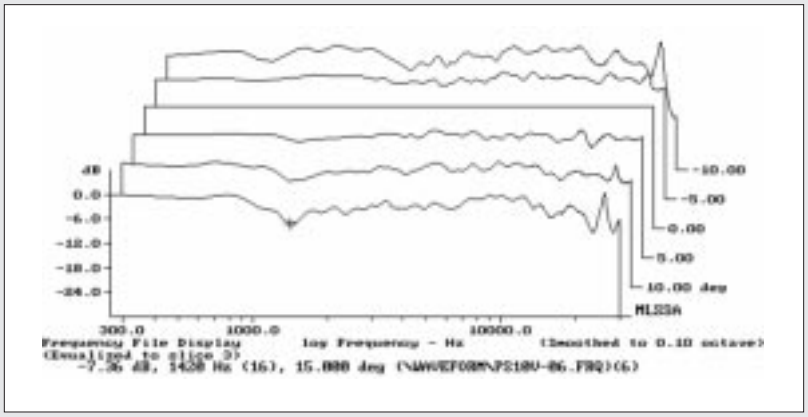

Fig.4 Paradigm Studio/100, vertical response family at 50", normalized to response on tweeter axis, from back to front: differences in response 10°–5° off-axis; reference response; differences in response 5°–15° off-axis.

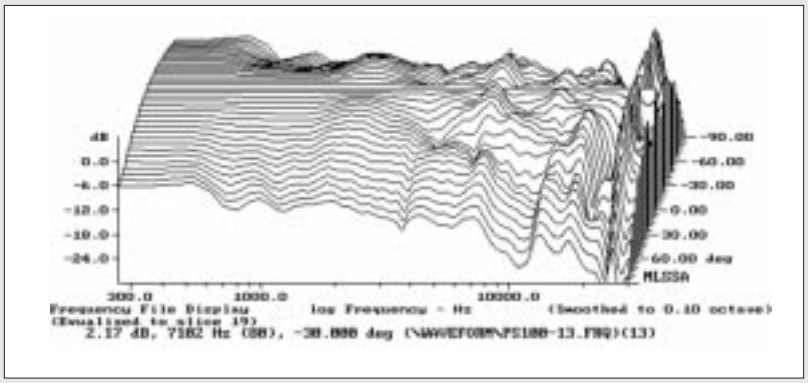

Fig.5 Paradigm Studio/100, horizontal response family at 50", normalized to response on tweeter axis, from back to front: differences in response 90°–5° off-axis; reference response; differences in response 5°–90° off-axis.

hint of mid-treble brightness alluded to earlier. Or the fact that, at very high levels, the sound hardens and loses focus. In one very difficult test, I played back portions of *Stereophile*'s new recording, *Rhapsody* (STPH010-2), at levels approaching those I heard live at the sessions. The Studio/100's were far happier (and the recording sounded superb —*shameless* plug) at levels 8–10dB lower. This is still very loud, and my listening room *is* very large. To be fair to Paradigm, theirs is the first loudspeaker on which I have tried this test (the recording is hot off the press as I write this), and the loudest I have ever tried to play back any similar recording.

Two more system changes followed. First, I switched from the Aragon 8008 amplifier to the new Carver Lightstar Reference 2.0 (review in progress). With the Carver, the Paradigms were simultaneously slightly more open at the very top and a little less bright in the mid-treble—which surprised me, as I've always found the Aragon to be a little laid-back in the mid-treble, with a little added sparkle at the extreme top. With the grilles in place, the Carver produced a noticeably improved balance in the Paradigms—almost as if the Carver's sound was synergistic with the changes wrought by the grillecloth. Now the sound with the grilles (all of my remaining comments reflect the listening results *with* grilles) had a welcome added sparkle—enough to be interesting, but not enough to detract from the overall balance. Some listeners might still find the Paradigms a little tipped-up on top, but I did not.

That slight mid-treble edge still remained, but it was now audible only on a limited selection of program material played at high levels. The midrange appeared to be a real strength of the design in all of my listening. My favorite vocalists were very much *there*, in the room, giving me a private performance. There was a small—but pleasing—degree of midbass warmth. It did not affect the vocal range; singers were full-bodied, but not overfed.

When you've been living with a big 18" subwoofer in your home-theater system (the Velodyne F1800RII, in my case), you tend to find almost any full-range loudspeaker a little tepid in the nether regions, even when the typical listener would be perfectly happy with that loudspeaker's bass response.

Such was the case with the Paradigm Studio/100's: They didn't really knock down the walls with subterranean output, but they did move a lot of air. The bass specification seems fair enough; certainly the response extends well into the mid-30Hz region. And the usual sonic spectaculars were impressive. If the Studio/100 didn't shake the walls with the falling drumset in *Dâfos* (Reference Recordings RR-12CD), it certainly came as close as any loudspeaker I've heard in its price range. "Hell's Bells," from *The Apocalypse Now Sessions* (Rykodisc RCD 10109), rumbled and groaned impressively. The percussive drumstrokes on the *Patriot Games* soundtrack (RCA 66051-2) were solid. And the big drum from Kodo's soundtrack for *The Hunted* (TriStar Music WK 67202) was reward-

M E A S U R E M E N T S

loudspeaker remains controversial, and in any event can rarely be achieved at more than a single point in space.)

The cumulative spectral-decay or waterfall plot is shown in fig.7. The treble region is relatively clean. A small resonance is visible at just under 6kHz—again, a possible cause of the slight occasional brightness, but too low in level to say for certain.

The measured resonances in the side and top panels (not shown) are high in frequency and well-damped. The back-panel modes are shown in fig.8. The response here is relatively clean, except for a dominant mode at just under 300Hz. This did not appear to be a factor in my listening tests. (It helps that the back panel faces away from the listener; I had it well away from the walls.)

Altogether, this is a very respectable measured performance. **– Thomas J. Norton**

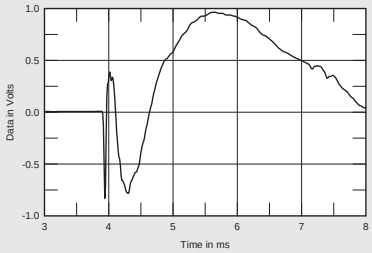

Fig.6 Paradigm Studio/100, step response on tweeter axis at 50" (5ms time window, 30kHz bandwidth).

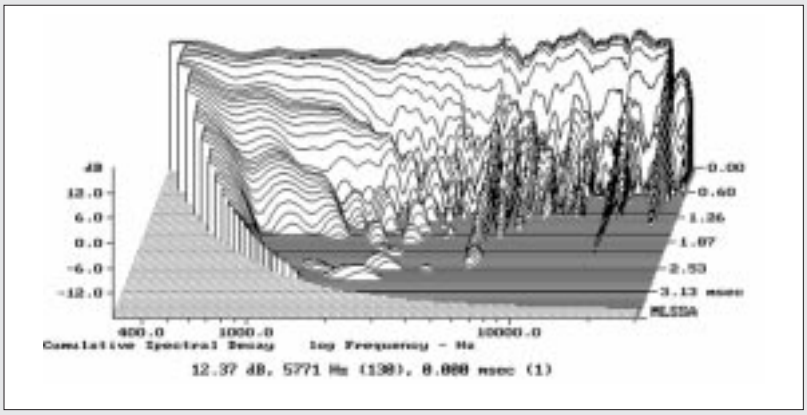

Fig.7 Paradigm Studio/100, cumulative spectral-decay plot at 50" (0.15ms risetime).

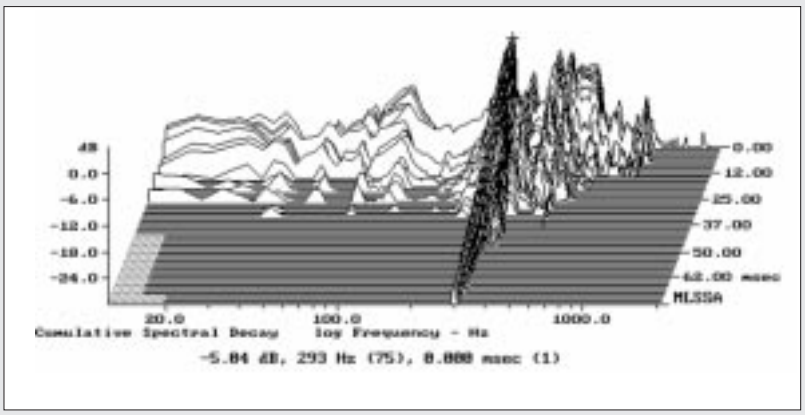

Fig.8 Paradigm Studio/100, cumulative spectral-decay plot of accelerometer output fastened to center of cabinet back wall. (MLS driving voltage to speaker, 7.55V; measurement bandwidth, 2kHz.)

System

The Paradigm 100's were auditioned in a system consisting of the Mark Levinson No.37 transport and No. 36S D/A converter, Rowland Consummate preamplifier, and Aragon 8008 power amplifier. Also pressed into service were the Carver Lightstar Reference Two power amp and the Sony CDP-XA7ES CD player. Interconnecting was via TARA Labs RSC Reference from D/A (or CD player) to preamp, and Cardas Hexlink from preamp to power amp. The digital link between the transport and the D/A converter was the Kimber AGDL. The loudspeaker cables were Monster M1.5s (top end) and Monster M2.2s (bass) in a bi-wire hookup.

All listening was conducted in my (approximately) 18' W by 26' L by 11' H listening room. Aside from the wall-to-wall carpeting, the room is acoustically treated with a mixture of RPG Diffusors, ASC Tube Traps and panels, and Wavelength Absorbing Linear Structures (WALS) and Wavelength Absorbing Panels (WAP) from System Analysis. (The last two devices perform acoustic absorption/bass-trap functions.)

– Thomas J. Norton

ingly stomach-thumping.

If I have any reservations at all about the bass, they're minor, and few relate to bass *quality*: percussive attacks were a little less, well, scary than the best I've heard, and I sensed signs of incipient distress with loud bass through one of the Studio/100s (a very slight, barely audible rustling or rushing air sound). The lack of truly deep extension was evident only on things like deep organ pedal—the deepest growls on Jean Guillou's organ transcription of Mussorgsky's *Pictures at an Exhibition* (Dorian DOR-90117) sounded impressively low, but lacked that true air-shuddering-in-the-pipes feel that you know is there once you've heard it on a state-of-the-art subwoofer [probably not]. I did try moving the Studio/100's a couple of feet closer to the wall behind them in an effort to add a little *oomph* to the bottom octave, but the loss in image quality was far greater than the gain in bass weight. Still, it's not really fair to expect room-crunching, subterranean bass from a pair of loudspeakers selling for under $2000. The Paradigms make their own way at the bottom end, and the case they make is convincing.

I had another pleasant surprise waiting for me when I made the second significant change in the system driving the Paradigms: substituting the Sony CDP-XA7ES CD player for the Levinson No.37/No.36S combination I'd been using. The Sony actually worked better with the Studio/100s. Its bass was a little richer and more powerful—neither a distinct plus nor minus there, actually—but its more full-bodied midrange lent a welcome increase in presence, especially on well-recorded vocals. Three recordings, in particular, were sheer magic over this system: Muddy Waters' *Folk Singer* (Mobile Fidelity UDCD 593), Mighty Sam McClain's *Give It Up to Love* (JVC/AudioQuest JVCXR-0012-2), and Terry Evans' *Puttin' It Down* (JVC/AudioQuest JVCXR-0014-2). If you're a regular reader of *Stereophile*, you are already aware of the quality of these recordings [*Waters was an R2D4, and the other two were Recordings of the Month—Ed.*]. The JVC XRCD discs are also a revelation. Like the Waters, the music is heavily acoustic in nature. There is something creepily *real* about the sound of these three discs. I have not yet heard the XRCD recordings through other loudspeakers, so can't say with assurance that the Paradigms were performing any special magic here. But what I can say for certain is that they definitely did nothing to detract from the experience.

Conclusions

Is the Studio/100 the best loudspeaker in its price range? Silly question, and impossible to answer. It combines a solid bass with an uncolored midrange, fine soundstaging, and a detailed, open top end. While it has its output-level limitations, these are no more troubling than in other loudspeakers selling for anything like realistic prices. On the negative side, it can, in some situations, sound a little too crisp on top, and there is an occasional edge audible in the mid-treble.

But you should definitely give the Studio/100 a listen. And if it's too pricey for your pocketbook, there are three other, less expensive models in the Paradigm Reference series that appear to use very similar drive-units and technology, and that may well display a distinct family resemblance to the sound of the flagship Studio/100. 1

MANUFACTURERS' COMMENTS

Paradigm Reference Studio/100

Editor:

Our sincere thanks to *Stereophile*, Tom Norton, and John Atkinson for reviewing the Paradigm Reference Studio/100. When a speaker (or any component, for that matter) arrives for testing at *Stereophile*, it goes through a rigorous review procedure. With the review of the Studio/100, positive comments like "combines a solid bass with an uncolored midrange, fine soundstaging, and a detailed, open top end" certainly make all the countless hours of design and listening worthwhile!

We would like to mention that all Paradigm Reference systems are designed to be used with the grilles on to eliminate edge diffraction. We have taken the liberty of including the frequency-response curve of the Studio/100 (serial number 11557) with the grille in place, as measured in our own anechoic chamber (fig.1). In addition, with regard to low-frequency response, this curve also shows very smooth balance from the midrange extending right through to the low-bass region.

Thanks again for the fantastic review. We are very pleased that Tom enjoyed the Studio/100's even more in this in-depth review than he did at HI-FI '96 (see "TJN's Best," *Stereophile*, October 1996). While we were indeed pleased to be included in the same paragraph as "megabuck" loudspeakers, for us it is even more gratifying to produce high-end speakers that anyone who loves music can afford.

W.A. VanderMarel
Director, Sales & Marketing,
Paradigm/AudioStream

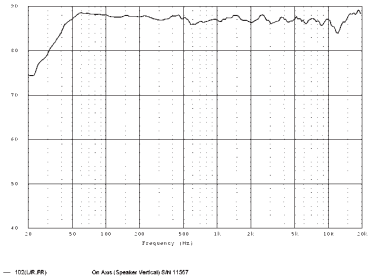

Fig.1 Paradigm Studio/100 (S/N 11557), anechoic response on tweeter axis.